Geologic events may have created Earth's oxygen supply

A NASA scientist recently reported that refined calculations and new evidence support a revolutionary suggestion that global-scale geologic events produced the bulk of Earth's oxygen supply.

Scientists have long believed that oxygen collected in Earth's early atmosphere as a by-product of plant life from a process called photosynthesis, in which plants take carbon dioxide and water to produce organic matter and oxygen.

David DesMarais of NASA's Ames Research Center, first suggested in 1992 a relationship between oxygen and the collision of continents, the resultant colossal mountain ranges and increased erosion burying huge amounts of organic matter in ocean beds.

"Although photosynthesis did provide an oxygen source strong enough to sustain the amount of existing oxygen, the creation and assembly of large modern-sized continents was responsible for early dramatic increases in oxygen," DesMarais said.

DesMarais recently reported new evidence supporting his findings at the Geological Society of America meeting in Denver.

DesMarais' research correlates oxygen "surges" in the atmosphere 2.2 to 2.0 billion years ago with changes in the amount of carbon stored in Earth's crust at that time. During that time, several of Earth's "micro" continents crashed together forming new, stable modern-sized continents. As the continental fragments collided, towering mountain ranges formed. Their steep slopes produced rapid erosion and sedimentation, key to DesMarais' theory.

Organic matter is normally consumed by bacteria and animals, a process that utilizes oxygen (respiration), producing energy and carbon dioxide and water as by-products. According to DesMarais, when huge amounts of organic matter were buried during cataclysmic collisions, oxygen was freed to accumulate in Earth's early atmosphere.

"The cycle of photosynthesis, which produces oxygen, and respiration, where oxygen is consumed, is an almost break-even process," he said. Only when large amounts of organic material are buried in ocean sediments during tectonic upheavals can the amount of oxygen in the atmosphere increase substantially.

STS-81 crew, Blaha talking

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will also deliver tons of food, fuel and other supplies as it has on previous Mir docking missions. The first shuttle mission of 1997 will be commanded by Astronaut Mike Baker, who recently talked about how the supplies transfer lessons of STS-79 are being put to use, and how he and his crew are progressing in their training.

"We have certainly talked with the STS-79 crew and listened to all their debriefs on transfer. Marsha Ivins is our loadmaster, and she has worked closely with Tom Akers, the STS-79 loadmaster, to see what recommendations he has made. Of course we will incorporate all of those.

"Specifically, I think one of the biggest things that's going to help us out is that on every one of these flights we're improving our logistics transfer. This time both the cosmonauts and John Blaha onboard the Mir will have done this once before already," Baker said. "The other thing we will do is to get timely information by talking to John several times and using our Mission Control folks over in Moscow to talk to him and make sure all of his stuff is ready to go. Even today we don't know exactly what we will be carrying up and transferring. So we will try to pin that down as soon as we can. I'm sure it will go smoothly."

Tech honors Bassett

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"It is gratifying to know that the laboratory bearing his name will help to encourage today's students to achieve their own personal goals."

Bassett was selected as an astronaut in October 1963. He was training for Gemini 9 along with Elliot See in February 1966 when they died in a T-38 training jet accident in St. Louis. Gemini 9 demonstrated rendezvous and space walk techniques used in Apollo.

"This is a tremendous honor and a generous remembrance of Charlie's life and accomplishments," said JSC Director George Abbey. "We share the pride that Charlie's family feels... This dedication reflects Charlie's own strong beliefs in the value of education and perseverance."

NASA Photo

Mars Global Surveyor sails into a cloudless sky atop its Delta II launch vehicle last Thursday.

Mars probe on its way

Mars Global Surveyor blasted off from Cape Canaveral Air Station's Launch Complex 17A at 11 a.m. CST last Thursday and is now on its way to a September 1997 rendezvous with the Red Planet.

Liftoff was delayed a day by clouds and upper-level winds, but with good weather the launch and automated Delta rocket operations went as planned.

The three-stage Delta vehicle and its nine solid-fuel strap-on boosters lifted the spacecraft 70 miles above the Earth, then the second stage boosted the payload to a circular parking orbit of 115 miles about 10 minutes after launch, where the spacecraft coasted for about 30 minutes before reaching its proper position over the eastern Indian Ocean.

The Delta's third stage fired for about 90 seconds to spin up Mars Global Surveyor to 60 rpm and send the Mars craft on its way.

The spacecraft's solar arrays deployed but telemetry indicated one of the solar panels did not fully open. The spacecraft team expected to have the array fully unfolded the next day.

Surveyor's radio signal was acquired on time, about 70 minutes after launch, by the 112-foot antenna of NASA's Deep Space Network at Canberra, Australia.

Today, Surveyor will fire its main engine in the first of four trajectory correction maneuvers to fine-tune its flight path to the Red Planet.

Aircraft control system wins 'Best of What's New'

An experimental aircraft flight control system that learns as it flies has been honored as one of the best technology developments of 1996.

Developed for NASA and the U.S. Air Force, the computerized flight control system has been installed on an 8-foot-4-inch remotely piloted aircraft called "LoFLYTE" being prepared for flight demonstrations this month. The jet-powered aircraft was developed by Accurate Automation Corp., Chattanooga, Tenn., under the Small Business Innovation Research program.

The LoFLYTE hypersonic waverider aircraft was named one of the 100 "Best of What's New" in the annual Popular Science magazine competition. Winners were announced Tuesday at an exhibition in New York City's Central Park and will be featured in the magazine's December issue.

The experimental LoFLYTE aircraft will be used to explore new flight control techniques involving neural networks, which allow the aircraft control system to learn by mimicking the remotely-sited pilot. Technologies being implemented in the LoFLYTE program could eventually find their way into commercial, general aviation and military aircraft. Flights are taking place at Edwards Air Force Base, Calif., with the support from NASA's Dryden Flight Research Center.

The model is a Mach 5 waverider concept, a futuristic hypersonic aircraft configuration that could cruise on top of its own shockwave if powered to reach hypersonic speeds. LoFLYTE represents the first known flying waverider vehicle configuration. In the current flight tests it is powered by a small-scale jet engine and will reach subsonic speeds to explore takeoff and landing control issues.

The aircraft has been designed to demonstrate that neural network flight controls are superior to conventional flight controls. Neural networks are computer systems that actually learn by doing. The computer network consists of many interconnected control systems, or nodes, similar to neurons in the brain. Each node assigns a value to the input from each of its counterparts. As these values are changed, the network can adjust the way it responds.

The LoFLYTE aircraft's flight controller consists of a network of multiple-instruction, multiple-data neural chips. The network will be able to continually alter the aircraft's control laws in order to optimize flight performance and take the pilot's responses into consideration. Over time, the neural network system could be trained to control the aircraft. This could enable pilots to control aircraft in highly difficult circumstances and even enable them to land in situations where critical control surfaces have been damaged.

Holidays to affect Roundup calendar, classified deadlines

Because of the Thanksgiving and Christmas holidays, Space News Roundup will not be published Nov. 29 or Dec. 27.

These changes will affect some deadlines.

The deadline for Swap Shop ads and Dates and Data calendar items for the Dec. 6 issue will be 5 p.m. Nov. 22.

Around Christmas, the deadline for Swap Shop ads to be published in the Dec. 20 Roundup will remain unchanged at 5 p.m. Dec. 6. The deadline for Dates and Data items for that issue also will be 5 p.m. Dec. 6.

The deadline for Swap Shop ads for the Jan. 4 issue will be 5 p.m. Dec. 18. The deadline for Dates and Data items for that issue will be 5 p.m. Dec. 20.

All ads and calendar items will be published on a space-available basis, first come, first-served. Any ads that cannot be published will be discarded and the requesting employee will need to re-submit a completed JSC Form 1452 to have the ad printed in a later issue.

Transition from WETF to NBL should be complete by late spring

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Part of the Sonny Carter Training Facility, the NBL will use the largest indoor pool in the U.S. to simulate the weightless environment of space and familiarize astronauts with the dynamics of body motion through the effect of "neutral buoyancy." The pool is 102 feet wide by 202 feet long and 40 feet deep and contains 6.2 million gallons of City of Houston water. It took 500 truckloads of concrete to pour the six-foot-thick floor. The NBL pool is 12 times larger than the Weightless Environment Training Facility, which is 78 feet long by 33 feet wide and 25 feet deep.

"The new facility is outstanding. It's something that is going to be extremely important for this agency and the future of human space flight and it is world-class in its capabilities," Ross said.

"I have been extremely pleased by the hard work and dedicated teamwork of all the people involved; they really pulled together," he added. "We hit some problems along the way and every agency involved, McDonnell Douglas and everyone on site, has pitched together and worked through them and met a demanding schedule."

Where astronauts previously could train only on International Space Station or shuttle in-pool configurations, in the NBL there is room to hold both shuttle and ISS mock-ups. It is large enough and equipped to handle two double-suited dives simultaneously, and to meet the projected requirements of the crew training schedulers the facility will have to be able to do that every day.

"There's no way we could have done that in our current facility—it is just not large enough to permit that," Ross said. "We will have a complete orbiter mockup, including its arm, and a very large portion of the station in the new tank simultaneously."

Harmon Roberts, the Flight Crew Support Division's lead for NBL facilities, said the imminent completion closes out a project that has been on and off the drawing boards for 13 years. At a Tuesday meeting, the ORI committee made substantial progress in tying up loose ends. "At our next meeting we're hoping to have all of our open actions completed and then it is just getting everything organized and ready for the final certification," he said.

Among the key players in the certification effort were NASA's Cliff Robinson, Mike Brzezinski, Robert Durkin, Carolyn Fritz, June Huhn, Leslie Schaschl and Tony Uttley, Johnson Engineering's Frank Martinez, Charlie Hoover, Hugh Gray, Kurt Otten, B.J. Mundine and Dario Velarde. They were the tip of the iceberg in a team that included Space and Life Sciences' Flight Crew Support and Medical Sciences Divisions; the Safety, Reliability and Quality Assurance Office; the Space Shuttle and International Space Station Program Offices; Boeing's Flight Equipment Processing Contract; the Business and Information Systems Directorate's television engineers; Engineering's Crew and Thermal Systems Division and the EVA Projects Office.

"Every area had its hard spots," said B.K. Miller, Johnson Engineering's manager of NBL operations, but on the first suited dive in the NBL by Johnson Engineering's Mark Liles, the pool, the suit, the breathing gas system, the divers, the communications system, the camera system all worked nearly flawlessly.

"It worked extremely well," Miller said. "Not just on schedule, but 45 days ahead of schedule. I've done this for decades and this is a first."

Among the toughest tasks were designing, testing and training operators on a breathing gas system that uses oxygen-enriched air to effectively eliminate the potential for an astronaut or diver getting the bends, which had not been a problem in the shallower WETF. The system for the space suits had to be safe, reliable and compatible with the tanks used by the divers.

"We had to order equipment, get it here, get it assembled, get it tested and put it into operation while we were doing all the WETF diving that we do on a normal daily basis," Miller said. "Same number of people—twice the work—and no fist fights."

The final testing schedule started with an unmanned space suit run in mid-October, followed by the first human dive in the NBL. Next, Scott Wright and Steve White made the first double-suited dive, which was followed in late October by the dives by Ross and Godwin.

The transition from the WETF to the NBL will be a four to six-month effort, Miller said, that should be complete in April or June. Johnson said he expects the transition from the WETF to the NBL to be smooth.

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